[This question paper contains 3 printed pages.]

1001 *Your Roll No.* .....

B.Sc. (Hons.) / I **C**

ELECTRONIC SCIENCE – Paper 1.1 (I)

(Mechanics and Strength of Materials)

Time: 3 Hours *Maximum Marks: 38*

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt **FIVE** *questions in all.*
Question No. **1** *is compulsory*
Marks are indicated against each question.

1. (a) Differentiate between the inertial and gravitational masses.

   (b) State Kepler's laws of planetary motion.

   (c) Show that theoretical limiting values of the Poisson ratio are 1 to 0.5.

   (d) Why a hollow shaft is stronger than a solid one of the same mass, length and material ?

   (e) State the basic postulates of Einstein Special Theory of Relativity. (2×5)

P.T.O.

2. (a) What is the difference between the Galilean and Lorentz Transformation ?

(b) Prove the Einstein's mass energy relation $E = mc^2$. (3+4)

3. (a) Define the terms Shear force and Bending Moment.

(b) Show that in case of a cantilever loaded at its free end, the depression produced at increases by 3 8 of its own weight when its own weight considered effective. (2+5)

4. (a) Derive two independent relations between the modulus of rigidity, Young's modulus, Bulk modulus and Poisson's ratio.

(b) Obtain the formula for the work done per unit volume in deforming a body. (4+3)

5. (a) What do you mean by Length contraction and Time dilation ? Derive the relation for length contraction.

(b) Calculate the length contraction observed in a meter rod moving with a speed of 0.6c which moves (i) parallel to its length (ii) perpendicular to its length. (4+3)

6. (a) Derive an expression for the gravitational potential and field at a point inside and outside a uniform spherical shell.

   (b) Calculate the amount of work required to send a body of mass m from the earth's surface to a height of 10R, where R is the radius of the earth. Express the result in terms of m, R and g. (4+3)

7. (a) Give the theory of simple bending. Explain the terms 'neutral axis', 'neutral surface' and flexural rigidity.

   (b) Draw a shear force and bending moment diagram for a simply supported beam of length ℓ carrying concentrated load W at a distance $\ell/3$ from the left support. (4+3)